

CLAIMS

1. An integrated circuit (IC) module comprising:  
a processor;  
volatile memory and nonvolatile memory operatively coupled to the  
processor; and  
a file system to manage access to one or more data files stored in the  
volatile memory and in the nonvolatile memory.

2. An integrated circuit (IC) module as recited in claim 1, wherein the  
file system exposes a set of application program interfaces that are used by an  
application to request the one or more data files stored in the volatile memory and  
the nonvolatile memory.

3. An integrated circuit (IC) module as recited in claim 2, wherein  
individual functions defined in the set of application program interfaces include a  
parameter identifying whether an associated data file is stored in the volatile  
memory or the nonvolatile memory.

4. An integrated circuit (IC) module as recited in claim 1, wherein the  
file system comprises a memory region directory to identify whether the one or  
more data files are stored in the volatile memory or in the nonvolatile memory.

1 5. An integrated circuit (IC) module as recited in claim 1, wherein the  
2 file system comprises:

3 a memory region directory to identify whether the one or more data files are  
4 stored in the volatile memory or in the nonvolatile memory; and

5 one or more file location specifiers to specify a physical location of the one  
6 or more data files.

7  
8 6. An integrated circuit (IC) module as recited in claim 5, wherein the  
9 file location specifier comprises a file allocation table.

10  
11 7. An integrated circuit (IC) module as recited in claim 5, wherein the  
12 file location specifier comprises a file allocation table.

13  
14 SUB A37 8. An integrated circuit (IC) module as recited in claim 1, further  
15 comprising at least one application stored in the nonvolatile memory and  
16 executable on the processor to request access to the one or more data files.

17  
18 9. An integrated circuit (IC) module as recited in claim 1, embodied as a  
19 smart card.

20  
21 10. An integrated circuit (IC) module comprising:  
22 a processor;  
23 volatile memory operatively coupled to the processor, the volatile memory  
24 storing volatile data in at least one data file;  
25

1 nonvolatile memory operatively coupled to the processor, the nonvolatile  
2 memory storing nonvolatile data in at least one data file;

3 a memory region directory to identify whether a requested data file is  
4 located in the volatile memory or in the nonvolatile memory; and

5 a file location specifier to specify a physical location of the requested data  
6 file within the volatile memory or the nonvolatile memory identified by the  
7 memory region directory as containing the requested data file.

8  
9 **11.** An integrated circuit (IC) module as recited in claim 10, wherein the  
10 data file stored in the volatile memory is destroyed when power is removed from  
11 the IC module.

12  
13 **12.** An integrated circuit (IC) module as recited in claim 10, wherein the  
14 memory region directory is stored in the nonvolatile memory.

15  
16 **13.** An integrated circuit (IC) module as recited in claim 10, wherein the  
17 file location specifier comprises:

18 a first file allocation table to specify physical locations of data files within  
19 the volatile memory; and

20 a second file allocation table to specify physical locations of data files  
21 within the nonvolatile memory;

22  
23 **14.** An integrated circuit (IC) module as recited in claim 10, wherein:  
24 the nonvolatile memory comprises both a read only memory and a  
25 read/write memory; and

the file location specifier comprises:

- (a) a first table to specify physical locations of data files within the read only memory;
- (b) a second table to specify physical locations of data files within the read/write memory; and
- (c) a third table to specify physical locations of data files within the volatile memory.

**15.** An integrated circuit (IC) module as recited in claim 10, further comprising an application program interface to enable an application to access the data files in the volatile memory and the nonvolatile memory.

**16.** An integrated circuit (IC) module as recited in claim 10, further comprising an initialization mechanism to delete any data from the volatile memory and to remove any reference to data files in the volatile memory from the memory region directory.

**17.** An integrated circuit (IC) module as recited in claim 10, embodied as a smart card.

**18.** A file system for an integrated circuit module, comprising:  
means for handling a request for a data file stored on the integrated circuit module;  
means for identifying whether the data file is located in volatile memory or nonvolatile memory; and

1 means for specifying a physical location of the data file within the volatile  
2 memory or the nonvolatile memory.

3  
4 **19.** A file system as recited in claim 18, further comprising means for  
5 deleting all data files in the volatile memory and for removing any reference to the  
6 data files that might be stored in the nonvolatile memory.

7  
8 **20.** An operating system for an integrated circuit (IC) module,  
9 comprising:

10 a file system to manage access to data files stored in both volatile memory  
11 and nonvolatile memory; and

12 an application program interface (API) to expose the file system to  
13 applications.

14  
15 **21.** An operating system as recited in claim 20 wherein the API defines  
16 a function for opening a data file, the function being used to open data files in the  
17 volatile memory and the nonvolatile memory.

18  
19 **22.** An operating system as recited in claim 20 wherein the API defines  
20 a function, the function including a parameter specifying whether a data file  
21 resides in the volatile memory or in the nonvolatile memory.

1       **23.**     An operating system as recited in claim 20 wherein the file system  
2 comprises:

3             a memory region directory to identify whether individual data files are  
4 located in the volatile memory or in the nonvolatile memory; and  
5             a file location specifier to specify a physical location of the requested data  
6 file within the volatile memory or the nonvolatile memory.

7  
8       **24.**     An operating system as recited in claim 23 wherein the file location  
9 specifier comprises:

10            a first file allocation table to specify physical locations of data files within  
11 the volatile memory; and  
12            a second file allocation table to specify physical locations of data files  
13 within the nonvolatile memory.

14  
15       **25.**     A file system for an integrated circuit module, comprising:  
16             an application program interface to enable an application to access files  
17 stored in volatile memory and nonvolatile memory; and  
18             a memory region directory to identify whether a file is stored in the volatile  
19 memory or the nonvolatile memory.

20  
21       **26.**     A file system as recited in claim 25, further comprising a file  
22 location specifier to specify a physical location of the file within the volatile  
23 memory or the nonvolatile memory.

1 27. A file system as recited in claim 25, further comprising:  
2 a first file allocation table to specify physical locations of data files within  
3 the volatile memory; and  
4 a second file allocation table to specify physical locations of data files  
5 within the non volatile memory.

6  
7 28. A computer-readable medium storing computer-executable  
8 instructions that, when executed on a smart card, direct the smart card to:  
9 store data in a volatile data file within volatile memory of the smart card;  
10 and  
11 facilitate access to the volatile data file by one or more applications.

12  
13 29. A method for operating an integrated circuit (IC) module,  
14 comprising:  
15 receiving a request for a data file stored on the IC module;  
16 identifying, within the IC module, whether the data file is located in volatile  
17 memory or nonvolatile memory; and  
18 specifying a physical location of the data file within the volatile memory or  
19 the nonvolatile memory.

20  
21 30. A method as recited in claim 29, further comprising exposing  
22 functions to manipulate the data files, the same functions being used regardless of  
23 whether the data files are located on the volatile memory or the nonvolatile  
24 memory.  
25

1 31. A method as recited in claim 29, further comprising deleting all data  
2 files in the volatile memory and for removing any reference to the data files that  
3 might be stored in the nonvolatile memory.

4  
5 32. A computer-readable medium storing computer-executable  
6 instructions that, when executed on a processor, perform the method as recited in  
7 claim 29.

8  
9 33. A method comprising:  
10 storing data in a volatile data file in volatile memory of an integrated circuit  
11 module;  
12 receiving, from a requestor, a request to access the volatile data file on the  
13 integrated circuit module;  
14 evaluating whether the requestor is authorized to access the volatile data  
15 file; and  
16 in an event that the requestor is authorized, locating the volatile data file in  
17 the volatile memory.

18  
19 34. A method as recited in claim 33, wherein the data stored in the  
20 volatile data file is produced by a first application and the requestor is a second  
21 application.

22  
23 35. A method as recited in claim 33, wherein the locating comprises:  
24 ascertaining that the volatile data file is located in the volatile memory; and  
25



1 specifying a physical location of the volatile data file within the volatile  
2 memory

3  
4 **36.** A method as recited in claim 33, wherein the locating comprises  
5 passing in a parameter that identifies the volatile data file as being stored in the  
6 volatile memory.

7  
8 **37.** A method as recited in claim 33, further comprising returning a  
9 handle to the volatile data file.

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11 **38.** A computer-readable medium storing computer-executable  
12 instructions that, when executed on a processor, perform the method as recited in  
13 claim 33.

14  
15 **39.** A method comprising:  
16 storing volatile data in at least one volatile data file in volatile memory;  
17 storing nonvolatile data in at least one nonvolatile data file in nonvolatile  
18 memory;  
19 receiving a request to access a particular data file;  
20 determining whether the particular data file is stored in the volatile memory  
21 or the nonvolatile memory; and  
22 locating the particular data file.

1 40. A method as recited in claim 39, wherein the locating comprises  
2 using a file allocation table to locate the particular data file.

3  
4 41. A method as recited in claim 39, further comprising exposing a  
5 common set of functions to manipulate both the volatile data files and the  
6 nonvolatile data files.

7  
8 42. A computer-readable medium storing computer-executable  
9 instructions that, when executed on a processor, perform the method as recited in  
10 claim 39.

11  
12 43. A method comprising:  
13 storing data produced by a first application within a volatile data file within  
14 volatile memory in a smart card; and  
15 accessing the volatile data file from a second application.

16  
17 44. A method as recited in claim 43, further comprising evaluating  
18 whether the second application is authorized to access the volatile data file.

19  
20 45. A computer-readable medium storing computer-executable  
21 instructions that, when executed on a processor, perform the method as recited in  
22 claim 43.

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